Properties of different antimony compounds

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8. Antimony exists in multiple oxidation states, primarily trivalent and pentavalent antimony. The toxicity of antimony is a function of the water solubility and the oxidation state of the antimony species under consideration (Elinder & Friberg, 1986). In general, trivalent antimony is more toxic than pentavalent antimony. The solubility and form of antimony compounds affect their mobility and bioavailability; for example, soluble forms like antimony potassium tartrate have a higher bioavailability than less soluble forms. Table 1 below summarises the chemistry, solubility, absorption and bioavailability of these antimony compounds.

9. Antimony can enter drinking water from various sources, including leaching from natural geological formations and human activities (e.g., mining). Soluble antimony remains mobile, while less soluble forms adhere to soil and sediments by binding with extractable iron and aluminium. Trivalent and

pentavalent antimony species can coexist and interconvert in the environment ((WHO, (2003); ATSDR, (2019); Health Canada, (2024)) The most common source of antimony in drinking water is through the dissolution of metal plumbing and fittings, with antimony (V), a less toxic form, considered to be the most frequent form in drinking water (DWI Communication).

10. In drinking water, the prevalence of pentavalent antimony can be explained by the oxidizing nature of the treatment processes generally applied (for example, chlorination or ozonation) which oxidize trivalent to pentavalent antimony, and by the types of plumbing solder and pipes in the distribution systems (Health Canada, 2024).

Table 1 below summarises absorption, bioavailability, solubility, and valency of different antimony compounds.

Antimony Compound	**Valency**	**Solubility**	**Absorption**	**Bioavailability**
Antimony Trioxide (Sb_2O_3)	+3	Slightly soluble in water	Poor gastrointestinal absorption (approx. 1%).	Poor bioavailability.
Antimony Pentoxide (Sb_2O_5)	+5	Very slightly soluble in water.	Generally, poorly absorbed.	Limited bioavailability data.
Antimony Potassium Tartrate (APT) (KSbOC4H4 O6)	+3	Highly soluble in water.	Higher absorption, up to 10% via gastrointestinal tract.	Higher bioavailability due to higher absorption.
Sodium Hexahydroxo-antimonate (NaSb(OH)6)	+5	Moderately soluble in water.	Limited data on absorption.	Limited data on bioavailability.

Antimony Trichloride ($SbCl_3$)	+3	Very soluble in water.	Relatively higher absorption compared to other antimony compounds.	Higher bioavailability compared to trioxide.
Stibine (SbH_3)	-3	Slightly soluble in water.	Limited absorption data available.	Limited data.
Elemental Antimony (Sb) or metallic antimony	0	Insoluble in water.	Not absorbed in elemental form.	Not bioavailable in its elemental form.
Meglumine antimoniate (C7 H18NO8Sb)	+5	Highly soluble in water.	Not absorbed orally but absorbed completely intramuscularly and subcutaneously.	Poor oral bioavailability. >90% bioavailable via intramuscular and subcutaneous route.
Sodium stibogluconate (C12H36Na3O26 Sb2+)	+5	Highly soluble in water.	Not absorbed orally but higher absorption following intramuscular and subcutaneous administration.	Poor oral bioavailability but higher bioavailability via intramuscular and subcutaneous route.